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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

HOGAN, MARY C

ART UNIT	PAPER NUMBER
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2123

DATE MAILED: 06/23/2004

7

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/761,600

Applicant(s)

SHAAR, ZAKWAN

Examiner

Mary C Hogan

Art Unit

2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02/27/03.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 6.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. This application has been examined.
2. **Claims 1-19** have been examined and rejected.

Foreign Priority

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file, specifically, United Kingdom Application Numbers 0001097.5 and 0001099.1 filed on 1/19/00.

Claim Rejections - 35 USC § 112

4. **Claim 8** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim states “multiple sends of the lower-level message followed by a single receive of a higher-level message” which appears to be in conflict with the specification definition of decomposition and those found in prior art specified below. It is concluded that the claim was meant to read multiple sends of a lower level message is ***preceded*** by a single receive of the higher-level message.

Claim Interpretation

5. **Claims 10-13** are directed to “messages”, “signals”, “message-type”, and “signal type”. It is disclosed in the specification that “messages are the basic units of communication between processes” (**specification, page 3**) and that “signals are the basic units of communication between VHDL design unit entities and VHDL processes of an entity architecture (**specification, page 5**). From these definitions derived from the specification, it was determined that since messages and signals both refer to basic units of communication between processes, the terms can be used interchangeably and the claims were further interpreted as such.
6. **Claim 8** is directed to a decomposition process. From the specification, decomposition is described as expressing a higher-level message as a series of lower level messages. Therefore, the claim was interpreted to be read as if multiple sends of a lower level message is ***preceded*** by a single receive of the higher-level message.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. **Claims 1, 10-14 and 19** are rejected under 35 U.S.C. 102(b) as being anticipated by Rayner (EP 0 854 429 A2), herein referred to as **Rayner**.

9. As to **Claim 1 and 19**, **Rayner** teaches a computer implemented simulation method comprising modeling a target system as a set of processes that communicate with each other by way of messages (**Figure 2**), scheduling messages for processing (**column 5, lines 10-13**), processing each scheduled message by calling sender and receiver processes associated with the message (**column 5, lines 15-16**), at least one scheduler queue (**column 3, lines 3-7**), scheduling the processes and messages by placing process-type items and message-type items on the scheduler queue (**column 5, lines 29-31 and column 11, lines 3-5**). Further, **Rayner** teaches processing each process-type item and message type item on the scheduler queue by calling the processes to which the item relates (**column 11, lines 8-12**).

10. As to associating the message with sender and receiver processes, it is taught that a signal is communicated from P1 to P2 (**Figure 9**) wherein the entry() function of P1 runs, updating the new_state value of output signal, S1, and calling the send_event() function of S1. This send_event() function causes an event record to be pushed on the queue. When the time arrives and the record is popped off the stack, the change_state() function of S1 is called and pop_events calls the fire_event () function of S1 which in turn calls the entry() function of the dependent process object P2 (**page 6, column 2 last paragraph-column 7, paragraph 2**). From this explanation, the message contained in the event record must have a pointer to S1 functions that are related to the P1, and to the functions of P2, the receiver of the message so it is known what functions to call. Therefore, for proper communication between a sender and receiver process, a message must be associated with those sender and receiver processes.

11. As to **Claim 10 and 14**, **Rayner** teaches an event queue and a delta queue (**column 3, lines 3-7**).

12. As to **Claim 11**, **Rayner** teaches scheduling the processes and messages by placing process type items and message type items on the scheduler queue (**column 5, lines 29-31 and lines 45-56**) wherein there is a pointer to a signal object (message type item), and the pop_event() field, when processing the

record (process type item), calls the fire_event() function of the signal object which in turn, calls the entry() function of the dependent process object (**column 11, lines 6-12**). Further, **Rayner** teaches processing each process-type item and message type item on the scheduler queue by calling the processes to which the item relates (**column 11, lines 2-12**).

13. As to **Claim 12**, **Rayner** teaches processes communicating with each other by way of signals (**column 3, lines 28-31**) and wherein said scheduler queue is used for scheduling the signals as well as the messages and processes (**column 5, lines 30-34**).

14. As to **Claim 13**, **Rayner** teaches scheduling the signals by placing signal type items on the scheduler queue (**column 5, lines 30-34**), processing each signal type item on the scheduler queue by updating the signal state and calling all processes that are sensitive to the signal (**column 10 line 56-column 11, line 12**).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

17. **Claims 2-5** are rejected under 35 U.S.C. 103(a) as being unpatentable over Rayner as applied to Claim 1 above, further in view of Lutter et al (Lutter et al, "Using VHDL for Simulation of SDL Specifications, IEEE, 1992), herein referred to as **Lutter**.

18. As to **Claims 2-5**, **Rayner** teaches associating the messages with sender and receiver processes (see paragraph 9).

19. **Rayner** does not expressly teach providing a message data structure for each message, when a process requires to send a message, assign a process to the relevant message data structure as a sender, and when a process requires to receive a message assign a process to the relevant message data structure as a receiver.

20. **Lutter** teaches providing a message data structure for each of the messages (page 632, column 2, lines 12-22), when a process requires to send a message, assign a process to the relevant message data structure as a sender (page 632, column 2, lines 18-22), and when a process requires to receive a message assign a process to the relevant message data structure as a receiver (page 632, column 2, lines 12-15).

21. **Rayner** does not expressly teach scheduling the message for processing only if one receiver for the message already exists in the message data structure and when a process is added as a receiver for a message, scheduling the message for processing only if one sender for the message already exists in the message data structure.

22. **Lutter** discloses that the queue process waits until either a signal is sent to it from another process or the SDL_behavior process enters a state in which it can accept a signal from the queue. When the SDL_behavior process sends a signal to the queue process, the queue process inspects the queue for a signal that is acceptable and sends it to the SDL_behavior process (page 632, column 2, lines 45-page 633, column 1, line 2). This encompasses the SDL_behavior process added as a receiver for a message and processing the message if it finds an acceptable signal or sender. Further, it is taught that arriving signals are stored in an input queue of a process (page 630, column 2, section 2) and if a signal cannot be accepted by the process, it is removed from the queue (page 631, column 1, lines 41-47 and page 632, column 2, lines 41-42). This encompasses the queue added as a sender for a message and scheduling the message if the signal is found acceptable by a receiver process.

23. **Rayner** does not expressly teach a sender queue and a receiver queue for queuing a number of sender and receiver processes.

24. **Lutter** teaches a sender queue and a receiver queue for queuing a number of sender and receiver processes (page 634, column 2, lines 34-38).

25. **Rayner** does not expressly teach checking the message data structure when a message has been processed to determine whether there is one remaining sender and receiver for the message and if so, rescheduling the message.

26. **Lutter** teaches that when an acceptable signal is found in a queue, a state transition is initiated (signal is processed) wherein the signals may be sent to other processes (**page 631, column 1, last 2 sentences- column 2 first 2 sentences**). Sending signals to other processes encompasses rescheduling the message if a remaining sender and a remaining receiver for the message exist.

27. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the step of associating messages with sender and receiver processes as taught in **Rayner** with the step of associating the messages with sender and receiver processes by providing a message data structure for each of the messages as taught in **Lutter** since VHDL signals contain the process id of the receiver (**page 632, column 2, lines 14-15**) and the process id of the sender is included to send a signal back to the sender of a message such as an acknowledge signal (**page 632, column 2, lines 18-27**).

28. Further it would have been obvious of one of ordinary skill in the art at the time the invention was made to further modify the step of associating messages with sender and receiver processes as taught in **Rayner** with the steps of when a process requires to send a message, assign a process to the relevant message data structure as a sender, and when a process requires to receive a message assign a process to the relevant message data structure as a receiver as taught in **Lutter** since these steps allow process to find an acceptable signal in the queue as taught in **Lutter** (**page 631, column 1, lines 41-50**).

29. **Claims 6-9** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Rayner and Lutter** as applied to **Claims 1 and 2** above, and further in view of Hashmi (U.S. Patent 6,161,081), herein referred to as **Hashmi**.

30. **Rayner and Lutter** do not expressly teach each message data structure holding pointers to a composition activity and a decomposition activity.

31. **Hashmi** teaches each message data structure holding pointers to a composition activity and a decomposition activity (**column 3, lines 38-40 and lines 46-47**).

32. **Rayner and Lutter** do not expressly teach the composition activity performs multiple receives of the lower level message followed by a single send of the higher-level message.

33. Hashmi teaches the composition activity performs multiple receives of the lower level message followed by a single send of the higher-level message (**column 5, lines 31-33, column 5 line 66- column 6, line 2**).

34. **Rayner and Lutter** do not expressly teach a single receive of a high level message followed by multiple sends of a lower level message.
35. **Hashmi** teaches a single receive of a high level message followed by multiple sends of a lower level message (**column 5, lines 19-24, lines 34-36, lines 45-48, 60-61**).
36. **Rayner and Lutter** do not expressly teach the decomposition activity for a message is activated when a process is added as a sender for that message and the composition activity for a message is activated when a process is added as a receiver for that message.
37. **Hashmi** teaches the decomposition activity for a message is activated when a process is added as a sender for that message (**column 5, explanation of decomposition process between U1 and U3**), and the composition activity for a message is activated when a process is added as a receiver for that message (**column 5, explanation of composition process between U1 and U2**).
38. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the message data structure as taught by **Rayner and Lutter** with pointers to composition and decomposition activities as taught in **Hashmi** since functional units of a design may be specified at different levels of complexity because the design of different units progresses at different rates as taught in **Hashmi** (**column 1, lines 11-21**).
39. **Claims 15-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Rayner** as applied to **Claim 1** above, and further in view of Wilkes et al (Wilkes et al, "Application of High Level Interface-based Design to Telecommunications System Hardware", ACM, 1999), herein referred to as **Wilkes**.
40. As to **Claims 15-17**, **Rayner** teaches signal, message and process type events on the event queue.
41. **Rayner** fails to teach an activity added to the event queue.
42. **Wilkes** teaches providing an activity data structure for a plurality of activities including a pointer to an associated activity process and a caller queue for queuing a number of caller processes, adding the caller process to the caller queue, scheduling the activity for processing and processing each scheduled activity by calling its associated process (**page 2, column 2, section 3.2, paragraph 1**).
43. **Rayner** teaches that a signal process is scheduled only if it is not already scheduled for processing (**column 10, lines 19-24**).
44. **Rayner** does not expressly teach an activity scheduled for processing.
45. **Wilkes** teaches the activity is scheduled only if it is not already scheduled for processing wherein if an activity is called from more than one place at a time, one caller gains access and the other has to wait although they will get access at a future time (**page 2, column 2, section 3.2, paragraph 1, last 3 sentences**).

46. **Rayner** teaches when a signal process finishes its processing, the corresponding process is removed from the queue (**Figure 4, element 408**) and if there are any remaining processes in the queue, the event is rescheduled (**Figure 4, step 405**).

47. **Rayner** does not expressly teach when an activity process finishes processing, the corresponding caller is removed from the caller queue and if there are any remaining caller processes in the caller queue, the activity is rescheduled.

48. **Wilkes** teaches a caller gaining access to the queue and if another caller process requests access, it must wait in the queue for processing. It is concluded that once the caller process is completed, it is removed from the caller queue and since there are remaining caller processes in the queue, the activity is rescheduled in order to process these requests (**page 2, column 2, section 3.2, paragraph 1 and Figure 2**).

49. It would have been obvious to one of ordinary skill in the art at the time the invention was made that the scheduling of processes and messages and their associated processing techniques as taught in **Rayner** could be modified with the addition of scheduling activities and their associated processing techniques as taught in **Wilkes** since activities describe and encapsulate system behavior as taught in **Wilkes** (**page 2, column 1, lines 5-9**).

50. As to **Claim 18**, **Rayner** teaches modeling a target system as a set of processes that communicate with each other by way of messages (**Figure 2**), scheduling messages for processing (**column 5, lines 10-13**), processing each scheduled message by calling sender and receiver processes associated with the message (**column 5, lines 15-16**), at least one scheduler queue (**column 3, lines 3-7**), scheduling the processes and messages by placing process-type items and message-type items on the scheduler queue (**column 5, lines 29-31 and column 11, lines 3-5**). Further, **Rayner** teaches processing each process-type item and message type item on the scheduler queue by calling the processes to which the item relates (**as discussed in paragraph 6**).

51. **Rayner** does not expressly teach the items on the scheduler queue having a type value that indicates the item type.

52. **Wilkes** teaches items on a scheduler queue having a type value (**page 2, section 3.1 and column 2, section 3.2**) where the parameter `q_cmd_t` is a type parameter.

53. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the items on the scheduler queue as taught in **Rayner** with a type parameter as taught in **Wilkes** to indicate the type of message that is being communicated between processes.

Conclusion

54. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary C Hogan whose telephone number is 703-305-7838. The examiner can normally be reached on 7:30AM-5PM Monday-Friday. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on 703-305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mary C Hogan
Examiner
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